USER'S MANUAL

1/1 AND 1/3 OCTAVE OPTION SD375 DYNAMIC ANALYZER II

MP MASTER
MA29903

Scientific-Atlanta
Spectral Dynamics Division

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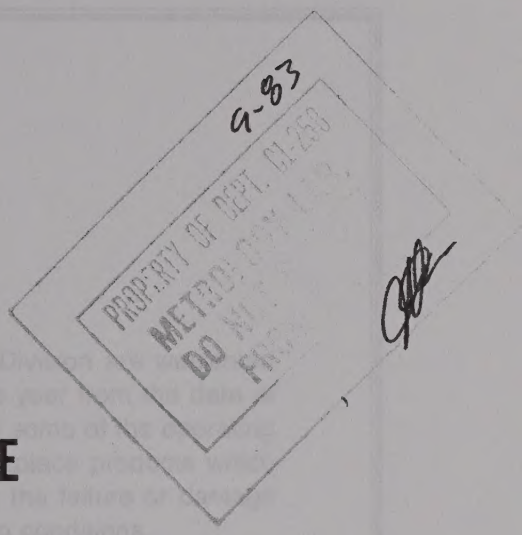

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1/1 AND 1/3 OCTAVE OPTION SD375 DYNAMIC ANALYZER II

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SECTION I

GENERAL INFORMATION

1.1 INTRODUCTION

This manual contains initial checkout and operating instructions for the 1/1 and 1/3 Octave Option for the Scientific-Atlanta Model SD375 Dynamic Analyzer II. The manual is divided into three sections. Each section covers a specific aspect of the option. This manual is written for the operator and contains no maintenance information. Maintenance information is included in the Service Manual for the SD375.

1.2 EQUIPMENT DESCRIPTION

The Octave Option consists of a PROM located on circuit card A5A8. All programming for the option is contained in the SD375's Microprogram. With the proper PROM installed, the Microprogram will respond to the appropriate front panel controls for the Octave Option. No additional equipment is required.

1.3 SPECIFICATIONS

Operational Characteristics

Center Frequency Ranges (1/1 Octave)	125 Hz to 63 kHz 63 Hz to 31.5 kHz 31.5 Hz to 16 kHz 16 Hz to 8 kHz 8 Hz to 4 kHz 4 Hz to 2 kHz 2 Hz to 1 kHz
Center Frequency Ranges (1/3 Octave)	100 Hz to 80 kHz 50 Hz to 40 kHz 25 Hz to 20 kHz 12.5 Hz to 10 kHz 6.3 Hz to 5 kHz 3.15 Hz to 2.5 kHz 1.6 Hz to 1.25 kHz
Display Range	30 bands for selected frequency range in 1/3 octave. 10 bands for selected frequency range in 1/1 octave.

Display	X-axis: LOG X Y-axis: LIN or LOG Overall: Right side of display Rate: 0.28 seconds
Readout	Center frequency and band number at cursor location. V, dB or EU for Y-axis at cursor location.
Averaging	LIN, EXPO or PEAK. LIN or EXPO on a redundant or non-redundant basis. Peak data is stored for each new ensemble.

Filter Characteristics

Attenuation	Greater than 60 dB
Passband Flatness	± 1 dB
Passband Uniformity	Meets ANSI S1.11 – 1966 Class III for 1/3 octave Class II for 1/1 octave

Minimum Transmission

Loss	± 1 dB
Linearity	± 1 dB or ± 0.1% of F.S. whichever is greater.

SECTION II

INSTALLATION

2.1 INTRODUCTION

This section contains instructions for field installation of the SD375 Octave Option. Procedures for inspecting, checking for physical damage, reshipment and returning under warranty or damage claims are in the SD375 User's Manual.

2.2 PREPARATION FOR USE

2.2.1 Option Included With Instrument

If you have received the SD375 with the option already installed, you won't need to read this. Proceed to Section III, Operation.

2.2.2 Option Field Installation

Removal of the top cover of the SD375 is required for access to circuit card A5A8. This is the circuit card where the Octave Option PROM is to be installed.

CAUTION

After you have removed the top cover from the SD375, you will notice that the power supply and crt assemblies have safety plates installed. These safety plates need not be removed for installation of this option. Voltages are present inside the instrument even when the power cord is disconnected. Be careful!

CAUTION

The Octave Option PROM is a MOS IC and is shipped in special conductive foam. This PROM is highly susceptible to damage from electrostatic charges, therefore, do not remove the PROM from the foam until it is to be inserted into the appropriate IC socket on the A8 circuit card. When inserting the PROM in the A8 circuit card, care should be taken to avoid physical contact with the leads or any other metallic portion of the PROM.

Read these instructions first, before attempting installation of the Octave Option PROM.

a. Remove power from the SD375 (turn it off).

b. Unplug the SD375.

c. Remove the top cover.

d. Remove the Control Processor circuit card from the slot marked A8, being careful not to catch any of the components on surrounding stationary objects.

e. Carefully remove the existing PROM from the IC socket marked U9 and place it in the special conductive foam.

f. Place the new PROM in the appropriate socket (U9) ensuring that it is inserted with the slot on the top of the PROM pointing towards the top of the circuit card. If you install the PROM upside-down, you're going to have problems.

g. Ensure that all plug-in IC's are firmly seated and that component parts mounted on the A8 circuit card do not protrude enough to cause damage when the circuit card is re-inserted.

h. Carefully re-insert the Control Processor circuit card in the slot marked A8. Make sure that the components on the A8 card are pointed in the same direction as the rest of the circuit cards.

i. Make sure that the card is fully seated and the top of the card is even with the other cards.

j. Replace the top cover of the SD375.

k. Plug in the power cord, turn the instrument back on and proceed to Section III.

SECTION III

OPERATION

3.1 INTRODUCTION

This section provides the operator with a description of the operating modes, the front-panel touch controls and indicators that affect or are affected by the option, and a brief operational checkout of the option.

3.2 OPERATING MODES

3.2.1 General Overview

The octave option provides separate input sampling and A/D conversion circuitry that conditions the input signal to provide the spectrum analysis program with digitized data in the lower frequency bands. In addition to the input signal samples taken by the narrow band circuitry, the octave option samples the input signal for lower frequency components, digitizes the analog data, and stores it in a separate octave input memory. After both memories have been loaded, their contents are transferred to processor memory where a spectrum analysis is performed on each set of data separately. The higher frequency spectrum cells from the narrow band spectrum are used to generate the octave presentation for those bands designated with an "X" in Table 3–1. To increase the resolution in the lower frequencies, the lower frequency cells for the octave presentation are taken from the frequency spectrum generated by the octave input memory data. These lower frequency bands are represented by a "0" in Table 3–1.

Since the octave bands are developed from digital narrow band filters, a given input signal may not produce any power in adjacent cells as with analog octave band filters. As a result, the crt display of a single tonal may not have the familiar conventional shape. An OCTAVE SHAPING MENU allows the operator to select either the standard SD375 shape or the conventional shape as shown in Figure 3–1. The OFF position of this menu selects the standard SD375 shape and the ON position selects the conventional shape. Both of these shapes conform to applicable ANSI standards.

The 1/1 octave mode of the option provides 10 bands with the center frequency of each band as listed in Table 3–1 and one additional band containing the overall spectrum data. In the 1/3 octave mode, 30 bands are provided with center frequencies as listed in the table.

3.2.2 CRT Annotation

The annotation information displayed on the crt periphery is the same as described in the SD375 User's Manual with these exceptions: The cursor information (shown in Figure 3–1) changes to indicate the band number at the cursor position and the center frequencies of the 1/3 (or 1/1) octave upper-most and lower-most bands.

Table 3-1. 1/1 and 1/3 Octave Bands and Center Frequencies

BAND NO.	CENTER FREQUENCY		SELECTED FRONT-PANEL FREQUENCY RANGE (kHz)							
			1/1	63	31.5	16	8	4	2	1
	1/1	1/3	1/3	80	40	20	10	5	2.5	1.25
49		80 kHz		X						
48	►	63 kHz		X						
47		50 kHz		X						
46		40 kHz		X	X					
45	►	31.5 kHz		X	X					
44		25 kHz		X	X					
43		20 kHz		X	X	X				
42	►	16 kHz		X	X	X				
41		12.5 kHz		X	X	X				
40		10 kHz		X	X	X	X			
39	►	8 kHz		X	X	X	X			
38		6.3 kHz		X	X	X	X			
37		5 kHz		X	X	X	X	X		
36	►	4 kHz		X	X	X	X	X		
35		3.1 kHz		X	X	X	X	X		
34		2.5 kHz		0	X	X	X	X	X	
33	►	2 kHz		0	X	X	X	X	X	
32		1.6 kHz		0	X	X	X	X	X	
31		1.25 kHz		0	0	X	X	X	X	X
30	►	1 kHz		0	0	X	X	X	X	X
29		800 Hz		0	0	X	X	X	X	X
28		630 Hz		0	0	0	X	X	X	X
27	►	500 Hz		0	0	0	X	X	X	X
26		400 Hz		0	0	0	X	X	X	X
25		315 Hz		0	0	0	0	X	X	X
24	►	250 Hz		0	0	0	0	X	X	X
23		200 Hz		0	0	0	0	X	X	X
22		160 Hz		0	0	0	0	0	X	X
21	►	125 Hz		0	0	0	0	0	X	X
20		100 Hz		0	0	0	0	0	X	X
19		80 Hz			0	0	0	0	0	X
18	►	63 Hz			0	0	0	0	0	X
17		50 Hz			0	0	0	0	0	X
16		40 Hz				0	0	0	0	0
15	►	31.5 Hz				0	0	0	0	0
14		25 Hz				0	0	0	0	0
13		20 Hz					0	0	0	0
12	►	16 Hz					0	0	0	0
11		12.5 Hz					0	0	0	0
10		10 Hz						0	0	0
9	►	8 Hz						0	0	0
8		6.3 Hz						0	0	0
7		5 Hz							0	0
6	►	4 Hz							0	0
5		3.15 Hz							0	0
4		2.5 Hz								0
3	►	2.0 Hz								0
2		1.6 Hz								0

BOTH OF THESE ARE 1/3 OCTAVE DISPLAYS OF THE SAME 500 HZ SQUARE WAVE. THE DISPLAY ON THE LEFT IS WITH SHAPING TURNED OFF SHOWING THE STANDARD SD375 1/3 OCTAVE DISPLAY. THE DISPLAY ON THE RIGHT IS WITH SHAPING TURNED ON SHOWING CONVENTIONAL SHAPING. SEE THAT?

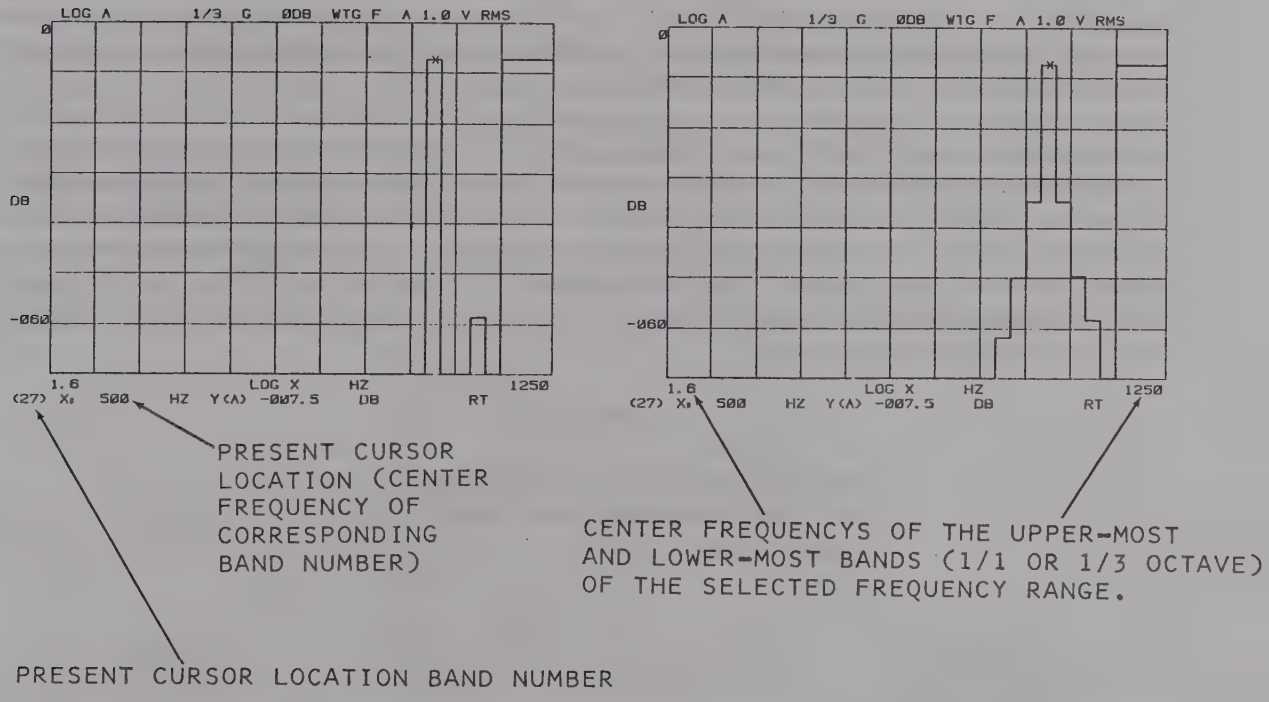

LOG A 1/3 G ØDB WTG F A 1.Ø V RMS
Ø
DB
-Ø6Ø
1.6
(27) X: 5ØØ HZ Y(A) -ØØ7.5 DB
LOG X HZ
RT
125Ø
LOG A 1/3 G ØDB WTG F A 1.Ø V RMS
Ø
DB
-Ø6Ø
1.6
(27) X: 5ØØ HZ Y(A) -ØØ7.5 DB
LOG X HZ
RT
125Ø
PRESENT CURSOR LOCATION (CENTER FREQUENCY OF CORRESPONDING BAND NUMBER)
CENTER FREQUENCYS OF THE UPPER-MOST AND LOWER-MOST BANDS (1/1 OR 1/3 OCTAVE) OF THE SELECTED FREQUENCY RANGE.
PRESENT CURSOR LOCATION BAND NUMBER

Figure 3-1. Octave Shaping and Display Annotation Changes

3.2.3 Graticule Display

In the 1/1 and 1/3 octave operating mode, the normal crt graticule is modified to provide 10 equally spaced horizontal divisions, each containing either three 1/3 octave bands or one 1/1 octave band. The Overall is displayed to the right of the spectrum data.

3.3 FRONT PANEL CONTROLS AND INDICATORS

Most front-panel controls and indicators function in the same manner as described in the SD375 User's Manual when using the octave option. However, certain switches are disabled and certain switch combinations should not be used because these combinations may produce erroneous display results. These combinations are discussed in the following paragraphs.

The Octave Option requires some modification to the front panel touch controls. Note the added group of touch controls labeled SPECTRUM. The 1/3 touch control is for 1/3 Octave analysis. The 1/1 touch control is for 1/1 Octave analysis. The NB touch control is for Narrow Band analysis and should be selected if octave analysis is not desired.

Figure 3–2 shows the FUNCTION group touch controls for both the standard instrument and the instrument with the Octave Option installed. Note that on the modified instrument, another touch control has been added to the center column. The touch control labeled LIST on the standard instrument has been changed to read MENU on the modified instrument. This is the only change to the touch control. The MENU touch control on the modified instrument operates the same as the LIST touch control on the standard instrument. The LIST touch control on the modified instrument is for OCTAVE listing and MARK listing only.

NOTE

Whenever the LIST touch control is referenced in the SD375 User's Manual, it should be interpreted to read MENU.

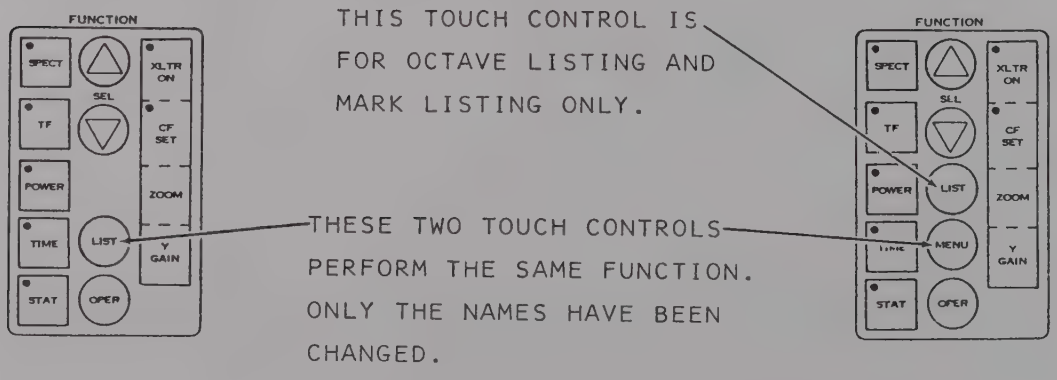
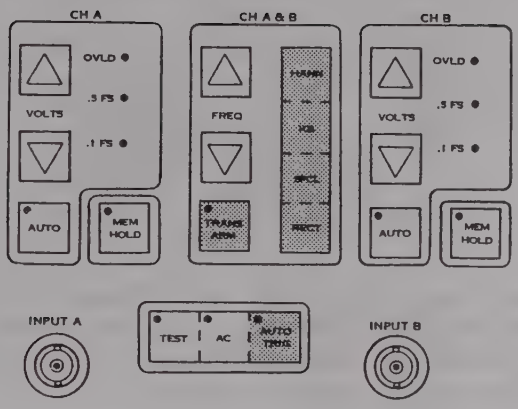


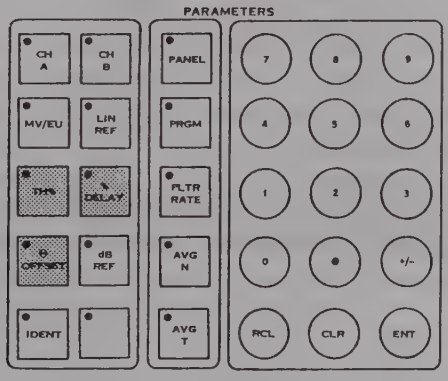
Figure 3–2. Modifications to the Parameters Group Touch Controls

3.3.1 Input Group



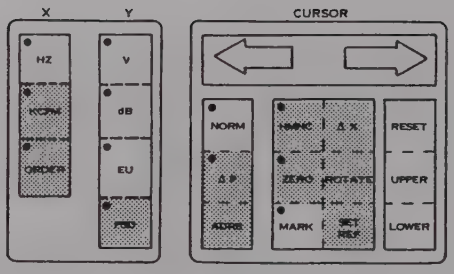
Refer to the applicable paragraph in the SD375 User's Manual. The weighting touch controls are disabled (HANN, KB, SPCL and RECT) along with the TRANS ARM and AUTO TRIG touch controls. The rest of the touch controls in this group operate the same as described in the SD375 User's Manual, except the frequency ranges available for octave analysis are the ranges listed in Table 3–1 of this manual.

3.3.2 PARAMETERS Group



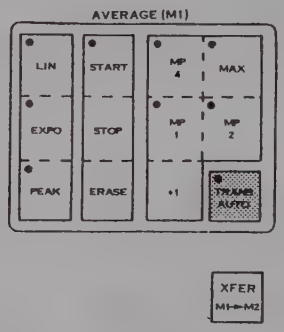
Refer to the applicable paragraph in the SD375 User's Manual. The TH%, % DELAY and Θ OFFSET touch controls are disabled. The rest of the touch controls in this group operate the same as described in the SD375 Users's Manual.

3.3.3 CURSOR Group



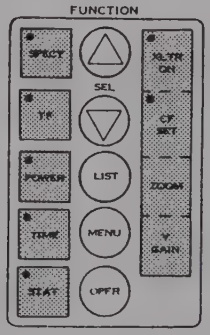
Refer to the applicable paragraph in the SD375 User's Manual. The X-axis KCPM and ORDERS touch controls are disabled. The Y-axis PSD touch control is disabled. The HMNC, △X △P, ADRS, ZERO, ROTATE and SET REF touch controls are disabled. The rest of the touch controls in this group operate as described in the SD375 User's Manual.

3.3.4 AVERAGE (M1) Group



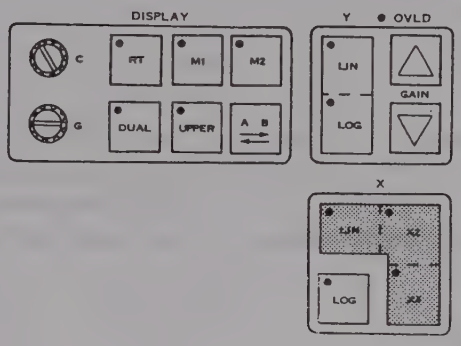
Refer to the applicable paragraph in the SD375 User's Manual. The TRANS AUTO touch control is disabled. The rest of the touch controls in this group operate as described in the SD375 User's Manual.

3.3.5 FUNCTION Group



Refer to the applicable paragraph in the SD375 User's Manual. The SEL UP/DOWN LIST, MENU and OPER touch controls are the only touch controls in this group that are operational. All other touch controls are disabled.

3.3.6 DISPLAY Group

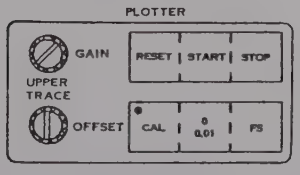


Refer to the applicable paragraph in the SD375 User's Manual. The A,B touch control works for OCTAVE MENU selections 2, 3, and 4. The XLIN, X2 and X4 touch controls are disabled. When the Y LIN touch control is pressed, the Y-axis scaling defaults to V (Volts).

NOTE

A dual display cannot be selected in the RT mode while using Octave. M1 must be selected for a dual display. Also, when in dual display mode, performing an average always averages CH A and the average count displayed (AVG N) will be for the data (A or B) in which the cursor is placed. If the dual display mode is selected when RT is selected, the instrument will default to M1.

3.3.7 PLOTTER Group



These touch controls operate as described in the SD375 User's Manual.

3.4 OPERATION

With the Octave Option installed, there are three new menus available to the operator, specifically for octave analysis. Also, an octave listing is available, providing not only a listing of the X and Y axis octave band values, but also the type of acoustic weighting in use, whether octave shaping is on or off and the Y-axis value of the overall signal.

3.4.1 Getting Started

Refer to the SD375 User's Manual and perform a "Panel, 0, RCL". A "PANEL, 0, RCL" isn't necessarily required each time the Octave Option is used; however, if the SD375 is in a configuration that is not compatible with octave analysis, you might encounter some problems. The "PANEL, 0, RCL" condition provides a convenient reference or starting point and eliminates any initial operating problems that could arise.

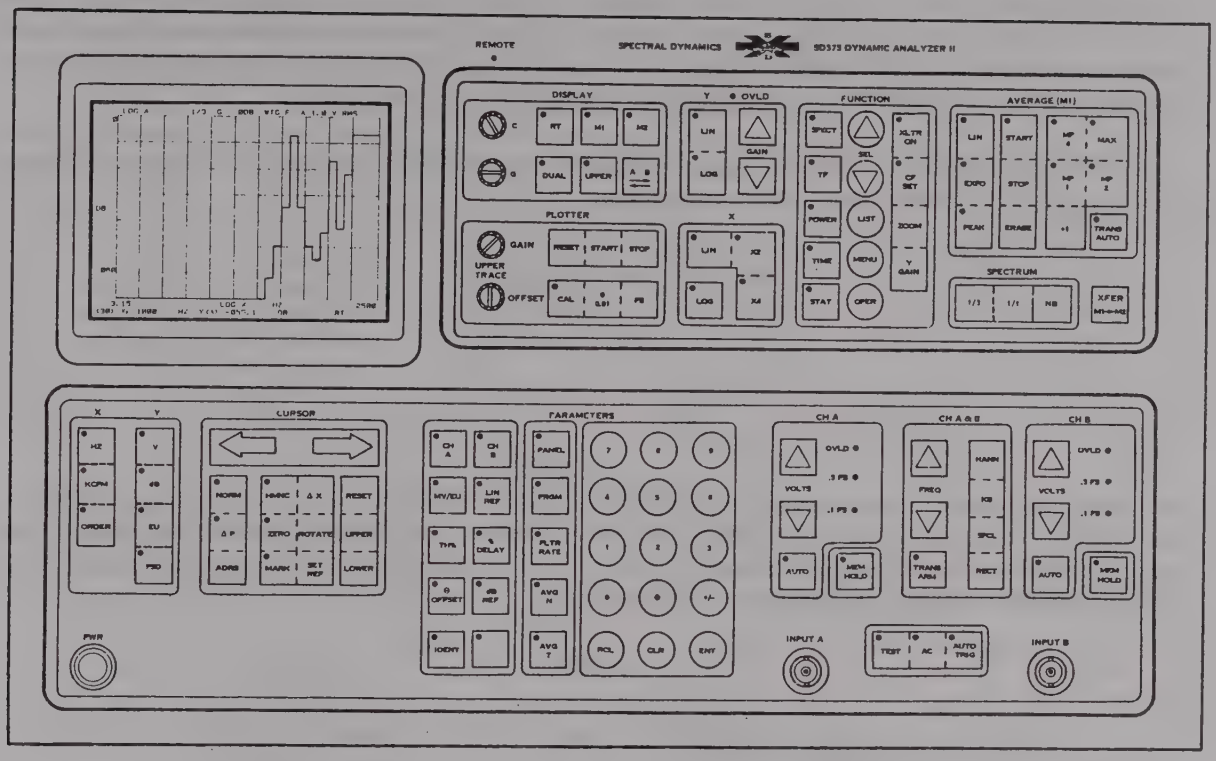
3.4.2 Using the Octave Menus

Refer to the front panel drawing and note that just below the AVERAGE (M1) group there is a group of touch controls labeled SPECTRUM. These are the touch controls for the Octave Option. Press either the 1/3 or the 1/1 touch control and then press the FUNCTION group MENU touch control. The following menu will be displayed:

```
                OCTAVE MENU

            * 1.   OCTAVE A & B
              2.   OCTAVE B/A
              3.   OCTAVE B-A
              4.   OCTAVE B+A


USE PRGM 7  FOR ACST WTG
USE PRGM 8  FOR SHAPING
```



Note that on the bottom of the OCTAVE MENU the statements "USE PRGM 7 FOR ACST WTG" and "USE PRGM 8 FOR SHAPING" appear. If you display the PROGRAMS menu, (press PRGM, press MENU) you will see that selections 7 and 8 are for OCTAVE WTG and OCTAVE SHAPING. It is not necessary to display the PROGRAMS menu to select PRGM 7 and PRGM 8. The PROGRAMS menu shown along with the OCTAVE ACST WTG MENU is provided for convenience only and will not appear unless the front-panel PRGM and MENU touch controls are pressed. To select PRGM 7, press PRGM, 7, MENU. The following menu will be displayed:

```
PROGRAMS

1.  ∫, ∫∫, ∛, ∛
2.  DIGITAL PLOTTER
3.  PRINTER INTERFACE
4.  I/O MENU
5.  SELF TEST
6.  SIGNAL SOURCE
7.  OCTAVE WTG
8.  OCTAVE SHAPING
9.  INTEGRATION CHAN SELECT
```

```
OCTAVE ACST WTG MENU

* 1.  FLAT
  2.  A
  3.  C
  4.  A OVERALL ONLY
  5.  C OVERALL ONLY
```

The OCTAVE ACST WTG MENU is used to select and apply a Type A or Type C weighting factor to the input signal. These weighting factors conform to current American and International standards including ANSI S.1.4, IEC R123 and IEC R179 over the dynamic range of the instrument. Menu selections 4 and 5 apply the weighting factors to the overall signal only.

The OCTAVE SHAPING MENU can be selected by pressing PRGM, 8, MENU in that order. When you do this, the following menu will be displayed:

```
OCTAVE SHAPING MENU

  1.   OFF
* 2.   ON
```

As previously stated in this section, the OCTAVE SHAPING MENU allows you to select either the standard SD375 shape or the conventional shape as shown in Figure 3-1. The OFF position on this menu selects the standard SD375 shape and the ON position selects the conventional shape. Both of these shapes conform to applicable ANSI standards.

NOTE

Shaping cannot be turned on in the 1/1 octave mode.

Selection of the individual functions on each of the octave menus is as follows: Display the menu. On the PARAMETERS group keyboard, press the number that corresponds to your menu selection. Press ENT. The asterisk on the menu will move to the number you selected. Press OPER. You're all set.

3.4.3 Using the Octave Listing

The octave listing function provides a listing of the X and Y axis octave band values, the type of weighting applied and whether octave shaping has been applied. Figure 3-3 is an example of listings for both 1/1 and 1/3 octave analysis. The related displays are also shown.

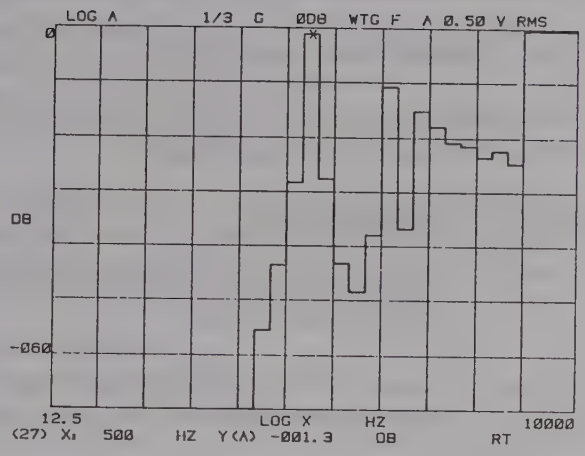
To select the octave listing, press either the 1/1 or the 1/3 touch control, then press the LIST touch control.

If you observe the listing as it appears on the display, you will notice that the listing appears one line at a time instead of being displayed all at once. The listing data is updated in the same sequence. For example, the X and Y axis values on the 1/3 OCTAVE LISTING are updated by line, not in numerical sequence. For instance, the first line that is updated on the 1/3 OCTAVE LISTING lists bands 11, 21, and 31. The second line lists bands 12, 22, and 32, the third, 13, 23, 33 and so forth. This is the sequence in which the data is updated.

1/3 OCTAVE LISTING

BN	HZ	DB	BN	HZ	DB	BN	HZ	DB
11	12.5	-070.0	21	125	-070.0	31	1250	-038.1
12	16	-070.0	22	160	-070.0	32	1600	-010.9
13	20	-070.0	23	200	-070.0	33	2000	-036.8
14	25	-070.0	24	250	-055.8	34	2500	-015.4
15	31.5	-070.0	25	315	-043.8	35	3150	-018.4
16	40	-070.0	26	400	-028.5	36	4000	-021.1
17	50	-070.0	27	500	-001.3	37	5000	-021.6
18	63	-070.0	28	630	-027.8	38	6300	-023.9
19	80	-070.0	29	800	-043.4	39	8000	-022.8
20	100	-070.0	30	1000	-048.4	40	10000	-024.9

FLAT WTG SHAPING ON OVERALL -000.4



1/1 OCTAVE LISTING

BN	HZ	DB
12	16	-070.0
15	31.5	-070.0
18	63	-070.0
21	125	-070.0
24	250	-070.0
27	500	-001.3
30	1000	-049.0
33	2000	-009.5
36	4000	-015.4
39	8000	-019.0

FLAT WTG SHAPING OFF OVERALL -000.4

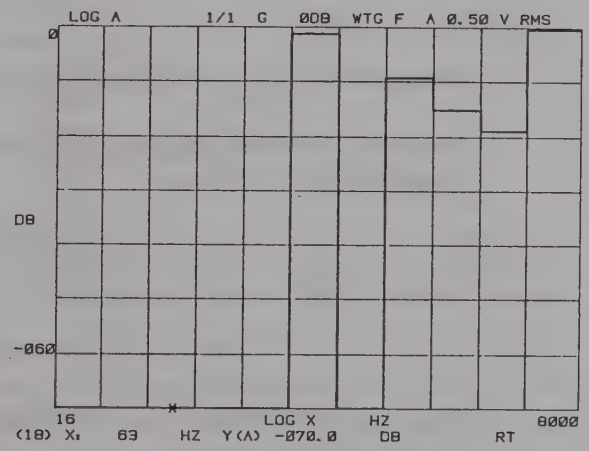


Figure 3-3. Examples of 1/1 and 1/3 Octave Listings With Corresponding Displays

NOTE

Although the Octave Listing lines are updated one at a time, the signal information is "frozen", or held in memory while the unit is in the Octave List mode, so that data continuity within a list will be maintained, even if the unit is in RT. This affect will be lost if you malnipulate the LIN/LOG, V/dB/EU or other touch controls which change the display. Other touch controls such as PLOTTER, START can be manipulated without losing this affect.

To remove either listing from the display, press the FUNCTION group OPER touch control.

3.5 OPERATIONAL CHECKOUT

The following procedures check cursor positioning and display readouts for each frequency range for both 1/1 and 1/3 Octave analysis.

3.5.1 Lower Band Check

a. With the Octave Option installed and power applied to the SD375, press the SPECTRUM group 1/1 touch control.

b. Ensure that the DISPLAY group RT and UPPER touch controls are selected (LEDs lit). The annotation on the top of the grid should appear as follows:

```
LOG A          1/1   G    ØDB   WTG F   A 1.Ø V RMS
```

c. Using the CH A & B, FREQ touch controls, select the 63 kHz frequency range.

d. Press the CURSOR group RESET touch control. The annotation on the bottom of the grid should appear as follows:

```
  125                        LOG X      HZ                63ØØØ
(21) X:   125     HZ   Y(A) -ØØ7Ø.Ø     DB          RT
```

Compare these readings with Table 3-2

e. Press the SPECTRUM group 1/3 touch control. The annotation on the top of the grid should change to read:

```
LOG A          1/3   G    ØDB   WTG F   A 1.Ø V RMS
```

f. Press the CURSOR group RESET touch control. The annotation on the bottom of the grid should appear as follows:

```
  1ØØ                        LOG X      HZ                8ØØØØ
(2Ø) X:   1ØØ     HZ   Y(A) -ØØ7Ø.Ø     DB          RT
```

Compare these readings with Table 3-2

NOTE

When performing the following steps, it will be necessary to press the CURSOR group RESET touch control each time the selection is changed from a 1/1 to a 1/3 Octave display. Don't forget.

g. Refer to Table 3-2 and sequentially select each frequency range for both 1/1 and 1/3 octave and compare the readings in the LOWER-MOST BAND NO. and LOWER-MOST CENTER FREQUENCY BAND columns on the table with the display readings described in steps d and f.

Table 3-2. Lower Band Check

1/1 Octave			1/3 Octave		
Freq Range (Hz)	**Lower-Most Band No.**	**Lower-Most Center Frequency Band**	**Freq Range (Hz)**	**Lower-Most Band No.**	**Lower-Most Center Frequency Band**
63000	(21)	125	80000	(20)	100
31500	(18)	63	40000	(17)	50
16000	(15)	31.5	20000	(14)	25
8000	(12)	16	10000	(11)	12.5
4000	(9)	8.0	5000	(8)	6.3
2000	(6)	4.0	2500	(5)	3.15
1000	(3)	2.0	1250	(2)	1.6

3.5.2 Upper Band Check

a. After completing all of the steps for the Lower Band Check, the instrument should be at the lowest frequency range for both 1/1 and 1/3 octave. If not, put it there.

b. Press the SPECTRUM group 1/1 touch control. Position the cursor to the right until the cursor readout reads:

(30) X: 1000 HZ

c. The cursor should be located at the last cell before the overall for each of these steps (for both 1/1 and 1/3 octave). If you're not sure of the cursor location, position the cursor one more step to the right. If the cursor is at the last cell before the overall, then moving it one more step to right should place the cursor on the overall and the cursor readout will look like this:

( ) X: HZ

After you've done this, make sure you move the cursor one step back to obtain a correct reading.

d. Press the SPECTRUM group 1/3 touch control. Make sure the cursor is on the last cell before the overall. The cursor readout will look like this:

(31) X: 1250 HZ

e. Refer to Table 3-3 and sequentially select each frequency range for both 1/1 and 1/3 octave and compare the readings in the UPPER-MOST BAND NO. and UPPER-MOST CENTER FREQUENCY BAND columns on the table with the cursor readout on the display (the readings will appear in the same place as described in steps d and f of the Lower Band Check).

Table 3-3. Upper Band Check

1/1 Octave			1/3 Octave		
Freq Range (Hz)	Upper-Most Band No.	Upper-Most Center Frequency Band	Freq Range (Hz)	Upper-Most Band No.	Upper-Most Center Frequency Band
1000	(30)	1000	1250	(31)	1250
2000	(33)	2000	2500	(34)	2500
4000	(36)	4000	5000	(37)	5000
8000	(39)	8000	10000	(40)	10000
16000	(42)	16000	20000	(43)	20000
31500	(45)	31500	40000	(46)	40000
63000	(48)	63000	80000	(49)	80000

f. You can perform these checks using either of two methods. The first method is by checking all the 1/1 octave frequency ranges and then all the 1/3 octave frequency ranges, or you can alternate between 1/1 and 1/3 octave for each frequency range. Remember, if the second method is used, you will have to reset the cursor for the Lower Band Check (when going from 1/1 to 1/3 octave), and you will have to re-position the cursor one step to the right for the Upper Band Check (when going from 1/1 to 1/3 octave).

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